Periodic Review

Regulatory Guide Number:	**1.52, Revision 4**
Title	**Design, Inspection, and Testing Criteria for Air Filtration and Absorption Units of Post-Accident Engineered-Safety-Feature Atmosphere Cleanup Systems in Light Water-Cooled Nuclear Power Plants**
Office/division/branch:	**NRR/DSS/SCPB**
Technical Lead:	**Nageswara R. Karipineni**
Staff Action Decided:	**Revise**
Date	**xx/xx/2023**

1. What are the known technical or regulatory issues with the current version of the Regulatory Guide (RG)?

Regulatory Guide (RG) 1.52, "Design, Inspection, and Testing Criteria for Air Filtration and Adsorption Units of Post-Accident Engineered-Safety-Feature Atmosphere Cleanup Systems in Light-Water-cooled Nuclear Power Plants," Revision 4 was published in September 2012. The RG provides methods and procedures acceptable to the NRC staff for the design, inspection, and testing criteria of the engineered safety feature (ESF) atmosphere cleanup systems in commercial light water nuclear power plants. Successful demonstration of ESF atmosphere cleanup systems is required by Appendix A, "General Design Criteria for Nuclear Power Plants," of Title 10 of the *Code of Federal Regulations*, Part 50, "Domestic Licensing of Production and Utilization Facilities" which includes but not limited to:

- Criterion 19, "Control Room;"
- Criterion 41, "Containment Atmosphere Cleanup;"
- Criterion 42, "Inspection of Containment Atmosphere Cleanup Systems;"
- Criterion 43, "Testing of Containment Atmosphere Cleanup Systems;"
- Criterion 61, "Fuel Storage and Handling and Radioactivity Control."

The RG does not apply to atmosphere cleanup systems designed to collect airborne radioactive materials during normal plant operation, including anticipated operational occurrences. RG 1.140, "Design, Inspection, and Testing Criteria for Air Filtration and Adsorption Systems in Light-Water-Cooled Nuclear Power Plants" provides guidance for these systems.

RG 1.52, Revision (Rev.) 0 was first issued in June 1973. There was no comprehensive standard for the design and testing of atmospheric cleanup systems available at that time. Therefore, the RG relied on isolated standards and guides when they are acceptable to the staff, such as Oak Ridge National Laboratory (ORNL)-NSIC-65, "Design, Construction and Testing of High-Efficiency Air Filtration for Nuclear

application," military specifications (MIL Specs), American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) Standards.

RG 1.52, Rev.1 was issued in July 1976. Rev. 1 relied on many of the same standards in Rev. 0 and included two new standards, draft standard ANSI N509, "Nuclear Power Plant Air Cleaning Units and Components" and ANSI N510-1975, "Testing of Nuclear Air Cleaning Systems." A significant number of nuclear power plants (NPPs) in the US were under design and construction during the periods of RG 1.52, Rev.1 and Rev. 2. As a result, nearly all the operating NPPs in the US have adopted Rev. 1 or Rev. 2 of RG 1.52. The first edition of ASME AG-1, "Code on Nuclear Air and Gas Treatment" (CONAGT) was issued in February 1986 (ASME AG-1-1986). RG 1.52, Rev. 3 issued in June 2001 adopted ASME AG-1-1997. Vogtle Nuclear Power Plant (NPP) Units 3 and 4 are the only NPPs to date that have adopted RG 1.52, Rev. 3.

Since the publication of Rev. 3 of RG 1.52, the ASME Committee expanded the scope of CONAGT by consolidating select requirements from ASME-N509 and ASME-510 and other documents previously endorsed by the staff in RG 1.52. The current Revision 4 to RG 1.52, issued in September 2012, endorsed ASME AG-1-2009, including 2010 Addendum 1a and 2011 Addendum 1b. However, none of the operating NPPs have adopted RG 1.52, Rev. 4.

Since the publication of RG 1.52 Rev. 4, ASME AG-1 was further revised to consolidate/incorporate additional requirements. The current AG-1 was issued in 2019 (ASME AG-1-2019) and the ASME is on schedule to issue another updated version of AG-1 in November 2023.

The operating NPPs have not adopted ASME AG-1, except for Vogtle NPP Units 3 and 4 adoption ASME AG-1-1997. A review of new reactor designs (e.g., NuScale, BWRX-300) indicate that they are not reliant on engineered safety feature (ESF) atmospheric cleanup systems. However, the outlook for nuclear power indicates a potential for significant expansion in the number of new applicants and creates the possibility that some of future designs may contain the need for ESF filter trains. While some standards remain out of the ASME-AG-1 scope, a significant number of the requirements for ESF filter trains have now moved into the scope of ASME-AG-1 scope, which has become the go to standard for ESF atmospheric cleanup systems.

Staff review also notes that some of the references within RG 1.52, Rev. 4 have been withdrawn and associated changes to RG 1.52 should be implemented, including:

- RG 1.3, "Assumptions Used for Evaluating the Potential Radiological Consequences of a Loss of Cooling Accident for Boiling Water Reactors," was withdrawn on December 12, 2016.

- RG 1.4, "Assumptions Used for Evaluating the Potential Radiological Consequences of a Loss of Cooling Accident for Pressurized Water Reactors," was withdrawn in December 2016.

- RG 1.25, "Assumptions Used for Evaluating the Potential Radiological Consequences of a Fuel Handling Accident in the Fuel Handling and Storage

Facility for Boiling and Pressurized Water Reactors," was withdrawn in December 2016.

2. What is the impact on internal and external stakeholders of <u>not</u> updating the RG for the known issues, in terms of anticipated numbers of licensing and inspection activities over the next several years?

For the existing U.S. fleet of operating light-water power reactors, the staff concludes that there would be no impact for not updating the RG. There are no known issues with the operating fleet that would require updating the RG. Not updating the RG will have no impact on compliance with their current design basis.

3. What is an estimate of the level of effort needed to address identified issues in terms of full-time equivalent (FTE) and contractor resources?

0.6 FTE for revising RG 1.52, Rev. 4.

4. Based on the answers to the questions above, what is the staff action for this guide (Reviewed with no issues identified, Reviewed with issues identified for future consideration, Revise, or Withdraw)?

Revise.

5. Provide a conceptual plan and timeframe to address the issues identified during the review.

The target date for completion of this revision should be established at the end of NRC fiscal year 2024 to support the staff review of additional SMR Design Certification Applications.

REFERENCES

1. Regulatory Guide 1.52 "Design, Inspection, and Testing Criteria for Air Filtration and Absorption Units of Post-Accident Engineered-Safety Feature Atmosphere Cleanup Systems in Light-Water-Cooled Nuclear Power Plants," Revision 4, September 2012 (ADAMS Accession No. ML12159A013).

NOTE: This review was conducted in August 2023 and reflects the staff's plans as of that date.